Math 121   **Test #3**   **Spring 2009**

1. (12 pts) A study was published this month in the Archives of Pediatrics & Adolescent Medicine[1], reporting that the obesity rate among U.S four-year-olds is 18.4%. The researchers studied a total of 8550 children. Use these statistics to test the hypothesis that the obesity rate for all U.S. four-year-olds is greater than 17%. Use $\alpha = 0.05$.

2. (8 pts) Use the information in the previous problem to find a 95% confidence interval for the obesity rate among U.S. four-year-olds.

3. (12 pts) Using data from the year 2000 U.S. census, we would estimate that the study cited in problem 1 involved 6420 whites and 1050 blacks. (The U.S. population in 2000 was 75.1% white and 12.3% black.) The study reports that the obesity rate for non-Hispanic white four-year-olds is 15.9% and for non-Hispanic black four-year-olds it is 20.8%. There appears to be a difference, but is there really a difference? Find out by testing the claim at the 5% significance level that the obesity rate for the black group is greater than the obesity rate for the white group. Use the white and black sample sizes given above.

4. (9 pts) Find the following probabilities.

   (a) $P(t > 2.6)$, with 10 degrees of freedom.

   (b) $P(t < -1.645)$, with 25 degrees of freedom.

   (c) $P(-2 < t < 2)$, with 2 degrees of freedom.

5. (12 pts) According to the U.S. Department of Energy, the average gasoline price on the East Coast earlier this week was $2.049 per gallon. Suppose we take a random sample of 10 gas prices from the Farmville area and obtain the following prices (rounded to the nearest penny):

   2.12   1.94   1.93   2.00   2.06   2.00   2.01   1.95   2.10   2.05

   Assume that the population of all gas prices in the Farmville area has a normal distribution. Use these data to test the hypothesis that the average gas price in the Farmville area is not $2.049 per gallon. Test at the 10% level of significance.

6. (8 pts) Use the data in the previous problem to calculate a 90% confidence interval for the average price of gasoline in the Farmville area.

7. (14 pts) Is the average price of gas in July higher than the average price of gas in January? Again using data from the U.S. Department of Energy, for the past 10 years, the average price of gas in January (on the East Coast) was $1.702, with a standard deviation of $0.691, while the average price in July of those same years was $2.063, with a standard deviation of $0.945. Test the hypothesis

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at the 5% level of significance that the average price of gas in July is higher than it is in January. Assume that the gas prices in both January and July are normally distributed.

8. (25 pts) Now let's use recent gas prices in New York City to predict gas prices in Los Angeles. More data from the U.S. Department of Energy show the following gas prices for New York (x) vs. Los Angeles (y) for the past 8 weeks.

Date	New York	Los Angeles
Feb 23	1.930	2.253
Mar 2	1.909	2.146
Mar 9	1.912	2.198
Mar 16	1.907	2.172
Mar 23	1.930	2.145
Mar 30	1.994	2.256
Apr 6	1.995	2.315
Apr 13	2.003	2.346

(a) (3 pts) On the graph paper below, draw a scatter plot of the data.

(b) (2 pts) Use the scatter plot to describe the relationship between x and y.

(c) (8 pts) Find the equation of the regression line.

(d) (3 pts) Draw the graph of the regression line on the graph paper below.

(e) (4 pts) Use the regression line to predict the gas price in Los Angeles when the gas price in New York is $1.95 per gallon.

(f) (5 pts) Find the value of SSE, the sum of squared residuals.